Remarks:

Applicant appreciates the Examiner's indication that claims 15 and 18-21 contain allowable subject matter. Claims 15 and 18 now have been amended to put them into independent form, so claims 15 and 18-21 should now be in condition for allowance. The only difference between the language of the claims as they currently stand and what they were before, besides putting claims 15 and 18 into independent form, is the language "has a diameter that spans" has been changed to "has a diameter and spans". The reason for this change is that, as described on page 14, beginning on line 1 of the specification, the diameter is defined to be the largest distance across the ball. Depending upon the configuration of the tire and the balls, such as in the case of a wide tire, the diameter of the ball may not be oriented in the direction from the tire casing to the rim, so it might not be the diameter that spans the space between the tire and the rim but rather another dimension of the ball that spans that space. In any case, the claims still include a limitation that the individual ball must span the space, which distinguishes the claimed invention from the prior art references that used a large number of small diameter balls, so that there were many layers of balls between the tire and the rim.

Claim 1 has been amended to add the requirement that at least some of the balls are independently free to shift circumferentially relative to the safety rim and the tire, so that, if one of the balls is punctured and deflates, others of the balls can shift circumferentially to help fill the space created by the deflated ball in order to continue providing support to the tire. A paragraph has been added to the specification to provide language as a basis for the claim amendment. This paragraph does not add new matter, as it simply describes what is shown in the drawings.

This amendment adds another distinguishing feature between the invention as recited in claim 1 and much of the prior art, in which the balls are not independently free to shift circumferentially relative to the tire and rim in order to redistribute themselves to help fill a gap if one of the balls is punctured and goes flat. For example, the Peck and Grubb references have spacers or body members with pockets, which keep the balls in a fixed position relative to the rim and tire, so the balls are not able to independently shift circumferentially to fill a space created by a deflated ball. In Peck, the body members 5, 6 form the pockets 8. In Grubb, the spacers 6, 6a also form pockets to hold the balls in a fixed position relative to the tire and rim.

Many other prior art references also prevent the balls from independently shifting circumferentially. For example, in the Welch reference, the balls are at least temporarily fastened in position until the gel sets up, and then, once the gel has set, the balls cannot move independently relative to the tire and rim. In Hill, the balls are fixed to the rim by axles E. In Mains, the balls are fixed to the rim with inlet tubes 10. In Evans and Jacobs, the balls rest in individual pockets held in position by spacers. In Harris, the balls are secured by their valves. In Booharin, the individual balls are held in position by fixed spacers. The balls in these prior art references cannot move to help fill a gap created if

one of the balls goes flat. In contrast, in the assemblies of the present invention shown, for example, in Figures 3, 16, and 17, the balls are free to shift independently in the circumferential direction to help fill a gap that would be formed if one of the balls went flat. Even if rim locks were used, the balls still could shift within the space between two adjacent rim locks to fill a gap formed by a deflated ball.

While the Krum reference does not prevent the balls from shifting circumferentially, it would not be obvious to mount the Krum design onto a safety rim to make the claimed invention. In Krum, there are several fixed inflation devices C, and the balls lie between the inflation devices C, so all the balls between two adjacent inflation devices C are free to shift independently to fill a gap that might be formed by a deflated ball. However, as explained in the declaration of Wade Summers, which is attached to this Amendment, it would not be possible to assemble the Krum design onto a safety rim, so it also would not be obvious to do so.

As has been described in the present patent application, it is not easy to assemble the tire onto the safety rim with the balls present. The safety rim is made in a single piece, and the edges of the tire have to fit over the rim in order to put the assembly together. Neither the edges of the tire nor the rim can stretch, so, in order for the tire edge to get over the rim, part of the tire edge that has already passed over the rim has to move into the recess in the inside of the rim in order to allow the other part of the tire edge to get past the remainder of the rim.

The attached Wade Summers declaration explains that, if more than two equally-spaced rim locks are used, so that the space between rim locks is 120° or less, it is not possible to get the edge of the tire over the rim in order to install the tire onto the rim. While the precise angular spacing that is required for assembly has not been calculated, it is clear that more than 120° of the tire edge inside the rim must be able to shift into the recess in order for the rest of the tire edge to fit over the remainder of the rim. Also, as explained in the Summers declaration, in the Krum design, in order for the design to function as intended, the inflation devices C would have to be located so as to provide both horizontal and vertical components of force to compress the balls, meaning that it would be necessary to use at least three of the inflation devices C. If three of the inflation devices C were used, there would not be sufficient space between the inflation devices to receive enough of the tire edge up into the rim to permit assembly of the tire casing onto a safety rim.

It should be noted that Krum uses a multi-part rim, as shown in Figure 3, which does not require the edge of the tire to fit over the rim as is required when a safety rim is used. While Krum states that a "clencher" tire casing or **other suitable construction**, and a rim of **any suitable kind** may be used, it should be noted that safety rims had not yet been invented at the time Krum made that statement, so he certainly could not have had a safety rim in mind as being a "suitable kind" of rim. And, while safety rims certainly are well-known now, it still cannot be considered obvious to mount the Krum design on a safety rim, since it would be physically impossible to do so, as explained in the Summers declaration. Since it is physically impossible to assemble the Krum design

using a safety rim, such a combination cannot be considered obvious to a person of ordinary skill in the art.

Many of the other prior art designs, such as Peck and Grubb, also could not be mounted onto a safety rim, because the spacers would interfere with the tire edge, preventing it from moving into the recess of the rim over a large enough angular distance to permit assembly. Of course, the designs of Peck and Grubb also can be distinguished from the invention recited in claim 1, because they do not permit the balls to shift independently in a circumferential direction relative to the tire and rim. The Evans design probably could be mounted onto a safety rim, because its spacers do not appear to interfere with the tire edge being recessed into the safety rim, but Evans does not permit the balls to independently shift in a circumferential direction as is now required by claim 1. Therefore, the claimed invention cannot be obvious based on Evans.

For the foregoing reasons, the invention recited in claim 1 is both novel and unobvious in view of the prior art.

Claim 2 depends from claim 1 and adds that there is a main valve extending through the rim to permit gas to be inserted into and removed from the hollow space that is formed between the tire and the rim through the main valve.

Claim 3 depends from claim 1 and recites that the inflated ball has its own valve.

Claim 4 depends from claim 2 and recites that the inflated ball has its own individual valve.

Claim 5 depends from claim 4 and adds a rim lock.

Claim 6 depends from claim 1 and recites that the balls have different internal pressures, with some balls having a lower pressure and others having a substantially higher pressure, such that the lower pressure balls compress more under load than the higher pressure balls, with the lower pressure balls and higher pressure balls being arranged at intervals in order to create an effect similar to providing knobs on the tire. As was explained in the specification, on page 13, beginning on line 3,

"While the preferred embodiment of the invention, as shown in Figure 3, has all the balls 18 inflated to approximately the same pressure, an alternative would be to inflate the balls 18 to different pressures, for example, alternating from a higher pressure in one ball to a lower pressure in the next adjacent ball, back to a higher pressure in the next ball, and so forth. This would have a similar effect to providing knobs on the tire 12, in that the lower pressure balls would compress more under load than the higher pressure balls, causing the portions of the tire 12 supported by the higher pressure balls to dig into the support surface, giving the resulting assembly very good traction properties."

Clearly, based on this description, claim 6 is not intended to claim the insignificant differences in pressure that occur with typical manufacturing tolerances, in which the balls are inflated to "approximately the same pressure". Claim 6 intends substantial differences in pressure, and with the differences being arranged in predetermined intervals, such as, for example, three adjacent balls at a low pressure and then the next two adjacent balls at a high pressure, followed by three balls at a low pressure, and so forth, so that the lower pressure balls compress more under load than the higher pressure balls, with the pressure variations serving a function similar to providing knobs on the outside of the tire, so as to provide improved traction properties. This has not been taught or suggested in the art.

Claim 7 depends from claim 1 and adds an inflatable tube between the balls and the rim, with the inflatable tube including a main valve that is accessible from outside the rim. In this design, each individual ball still spans the space between the tire and rim, meaning that there is only a single layer of balls between the tire and rim, not multiple layers, and, in addition, the tube can be inflated between the balls and the rim.

Claim 8 depends from claim 1 and recites that the balls are made of polyurethane sheets that are welded together and have individual valves. Such balls, made of welded-together sheets and with individual valves have not been taught for use in such a combination.

Claim 9 is an independent claim, which has been amended to add the limitation that at least some of the balls are independently free to shift circumferentially relative to the tire and rim. As was explained with respect to claim 1, this distinguishes the claimed invention from much of the prior art, in which the balls are restrained from independent movement in the circumferential direction, which means that they cannot shift to fill a space formed by a punctured or deflated ball. While the Krum reference does permit the balls to independently shift in a circumferential direction, it would be impossible to assemble this design onto a safety rim, as was explained earlier. Thus, the assembly recited in claim 9 is both novel and unobvious in view of the prior art.

Claim 10 depends from claim 9 and recites that the balls are made of welded together sheets, which, as explained above, has not been taught for such an assembly.

Claim 11 depends from claim 10 and further that the sheets are made of polyurethane.

Claim 12 depends from claim 9 and recites that the balls are inflated to substantially different internal pressures. Again, the use of substantially different pressures provides an advantage that is not taught or suggested by the prior art.

Claim 13 depends from claim 9 and adds the use of a rim lock.

Claim 14 depends from claim 9 and adds the inflatable tube between the balls and the rim, with a valve accessible through the rim for inflating the tube.

Claim 16 depends from claim 9 and includes specific details of the characteristics of the balls that are not taught or suggested in the prior art.

Claim 17 depends from claim 1 and recites that the balls are made of polyurethane sheets that are welded together.

As all the claims define an invention that is both novel and unobvious in view of the prior art, Applicant respectfully requests allowance of all the claims now pending in the present application. If there are any further problems with this application, Applicant's attorney would appreciate a phone call from the Examiner to help expedite their resolution.

Respectfully submitted,

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#10 Wade 8/15/03

In the U.S. Patent and Trademark Office

U.S. Patent Application S.N. 09/879,709

Title: Tire Inflated With A Plurality Of Balls

Filing Date: June 12, 2001

Group Art Unit: 1733

Examiner: Justin R. Fischer

Declaration of Wade Summers

I, Wade Summers, hereby declare the following:

1. I am the inventor of the invention described in the referenced patent application.

2. I have reviewed U.S. Patent No. 952,675 "Krum", and, based on my experience, I believe it would be impossible to mount the design of Krum on a safety rim.

3. I have tried to mount my tire on a rim using three equally-spaced rim locks, and I have found that it cannot be done. In order for the tire to fit over the rim, it is necessary for part of the tire to be recessed up into the rim to create the space to fit the remainder of the tire over the rim. If I use two or fewer rim locks, giving me at least 180° of freedom, I can mount the tire. However, if three equally-spaced rim locks are used, leaving only 120° between the rim locks, it is not possible to recess enough of the tire up into the rim to create enough room to fit the tire over the rim. Therefore, I know from testing that it is necessary to have more than 120° of free space into which the edge of the tire can be recessed into the rim in order to mount a tire onto a safety rim.

4. The Krum design uses a plurality of inflatable elements "C" spaced around the rim in order to compress the balls. These inflatable elements "C" have "relatively flat and stiff end members", which project much farther out from the rim than do my rim locks, so each of the inflatable elements "C" would interfere much more with installation of the tire than do the rim locks that I have used in conjunction with my design.

5. The patent drawings of Krum show four such inflatable elements "C" equally spaced around the rim. When trying to mount the tire of Krum over a safety rim, those inflatable elements "C" would create a barrier that would prevent the installer from moving the tire up into the rim, just as the rim locks have done in my tests, except, as explained above, each of the inflatable elements "C" would create a greater barrier, since it projects much further out from the rim than do the rim locks. Thus, I doubt that it would possible to mount the tire casing onto a safety rim if there are two of the inflatable

elements "C" present, and I know that it would be impossible to mount the tire casing onto a safety rim if there are three or more of the inflatable elements "C" present.

6. The inflatable elements "C" of Krum expand to the sides. If only two inflatable elements "C" were placed at the top and bottom of the tire shown in Figure 1 of Krum (the 12:00 and 6:00 positions), rather than four elements as are actually shown, those two inflatable elements would only apply force in a horizontal direction. This would not provide a vertical component of force, which would be needed to compress the balls on the sides, such as the balls at the 3:00 and 9:00 positions. Although Krum says the number of inflatable sections could vary with the conditions and the preference of the user, it can be seen that, in order for the Krum design to function as intended, it would require at least three equally-spaced inflatable elements, in order to apply components of force both vertically and horizontally so as to compress all the balls. If one used at least three of Krum's inflatable elements "C", there definitely would not be sufficient free space between the inflatable elements to permit the tire to be mounted onto the rim. Since the Krum design would require at least three inflatable elements to function as intended, and since the use of three inflatable elements would make it impossible to mount the design on a safety rim, it certainly is not obvious to me to mount the design of Krum on a safety rim.

7. I also doubt that the design of Krum would actually function under real operating conditions, because, if the balls were elastic enough to distort into a cylindrical shape due to the force of the expanders, as taught by Krum and shown in Figure 2, they probably would also distort so much that they would not support the weight of the vehicle.

8. Since it would be physically impossible to mount the Krum design onto a safety rim in a manner that would permit it to function as taught, and since the Krum design probably would not function successfully under normal operating conditions, I do not think a person of ordinary skill in the art would consider it obvious to mount the Krum design onto a safety rim.

9. I hereby declare that all statements made herein of my knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

Wade Summers

8-8-03
Date